6. PREDHODNE ARHEOLOŠKE IN DENDROKRONOLOŠKE RAZISKAVE NA KOLIŠČARSKI NASELBINI VELIKI OTAVNIK Ib PRI BISTRI

Andrej GASPARI, Katarina ČUFAR, Miran ERIČ & Tjaša TOLAR

Izvleček

Leta 2006 so bili med podvodnim pregledom struge potoka Bistra na Ljubljanskem barju nedaleč od vznožja hribovitega kraškega obrobja odkriti ostanki koliščarske naselbine Veliki Otavnik Ib. Dedrokronološka analiza lesenih nosilnih kolov je pokazala, da naselbina sodi v horizont kolišč 4. tisočletja pr. Kr. in da je sočasna z naselbino Stare gmajne.

Ključne besede: arheologija, dendrokronologija, koliščarska naselbina Veliki Otavnik Ib, eneolitik.

6. PRELIMINARY ARCHAEOLOGICAL AND DENDROCHRONOLOGICAL RESEARCHES AT THE PILE-DWELLING SETTLEMENT VELIKI OTAVNIK Ib NEAR BISTRA

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Abstract

In 2006, we discovered remains of a pile-dwelling settlement Veliki Otavnik Ib during underwater survey of the riverbed of the Bistra stream at the Ljubljansko barje, not far from the foot of the mountainous Karstic fringe. Dendrochronological analysis of wooden foundation piles showed that the settlement dates to the horizon of pile-dwellings from 4th millennium BC and that is contemporary with the settlement Stare gmajne.

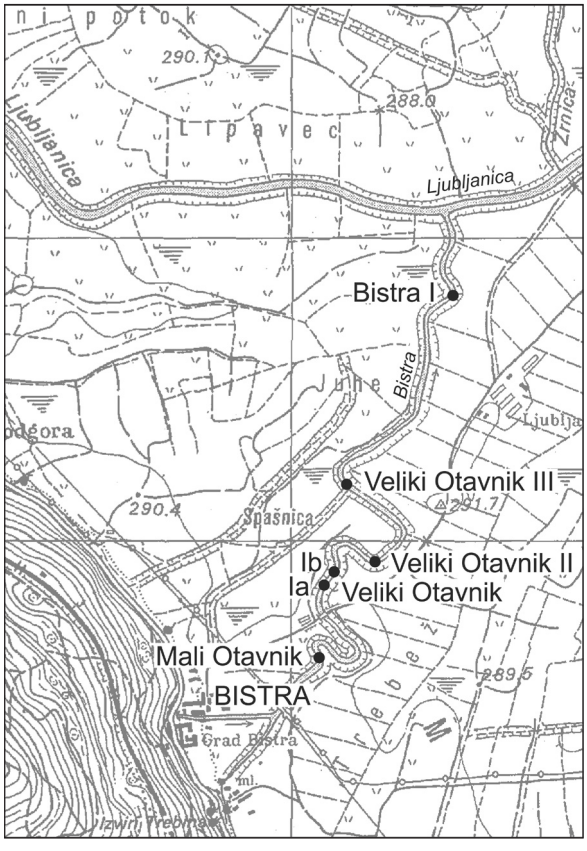
Keywords: archaeology, dendrochronology, pile-dwelling settlement Veliki Otavnik Ib, Eneolithic.

6.1 UVOD

V okviru delovnega programa Skupine za podvodno arheologijo in pod okriljem ljubljanske območne enote Zavoda za varstvo kulturne dediščine Slovenije je v letih 2005 in 2006 potekalo sistematično rekognosciranje potokov Ljubija in Bistra na Ljubljanskem barju z namenom, da se evidentira, dokumentira in poda preliminarna ocena potenciala arheoloških najdišč v omenjenih desnih pritokih Ljubljanice, ki v okviru arheološkega raziskovanja Ljubljanskega barja do nedavnega nista bila deležna večje pozornosti (*sl. 6.1*). Tako je bil izveden intenziven terenski pregled izpostavljenih delov glinene podlage s kolekcijo značilnih najdb, zaradi močnega erozivnega delovanja potoka pa smo se odločili tudi za preventiven odvzem vzorcev lesenih navpičnih kolov. Lokacije najdb in kolov ter morfološke značilnosti korita z bregovi so bile izmerjene z elektronskim teodolitom in umeščene v državni koordinatni sistem. Arheološke najdbe in terensko dokumentacijo v skladu z Odločbo Ministrstva za kulturo začasno hrani ZVKDS OE Ljubljana, dendrokronološke

6.1 INTRODUCTION

As part of a working programme of the Group for underwater archaeology of the Institute for the Protection of Cultural Heritage of Slovenia a systematic reconnaissance of the Ljubija and Bistra streams at the Ljubljansko barje was carried out in 2005 and 2006. Our intention was to register, document and make a preliminary assessment of potential archaeological sites in the mentioned right tributaries of the Ljubljanica. These have, until recently, not received much attention in frame of archaeological research of the Ljubljansko barje (*Fig. 6.1*). An intense field examination of exposed parts of clayey base with collection of characteristic finds was performed. Due to the stream's strong erosive effects, we also decided to collect wooden vertical pile samples. Positions of finds, piles and morphological features of the riverbed with banks were recorded with total station and projected to the coordinate system of Slovenia. Archaeological finds and field documentation are, according to a decree of the Ministry of Culture,



Sl. 6.1: Zahodni del Ljubljanskega barja z novoodkritimi arheološkimi najdišči. Izsek s karte 1 : 25.000 (DTK25, © Geodetska uprava RS). Pripravila: T. Korošec.
Fig. 6.1: The western part of the Ljubljansko barje with newly discovered archaeological sites. Section from a map 1 : 25.000 (DTK25, © Geodetska uprava RS). Prepared by: T. Korošec.

vzorce pa Oddelek za lesarstvo Biotehniške fakultete Univerze v Ljubljani.

Čeprav je terenska ekipa v strugi Bistre odkrila dve doslej neznani koliščarski naselbini, Mali Otavnik in Veliki Otavnik Ib, ter sledove še štirih potencialnih kolišč Veliki Otavnik Ia, Veliki Otavnik II, Veliki Otavnik III in Bistra I,[1] v prispevku predstavljamo rezultate raziskav na koliščarski naselbini Veliki Otavnik Ib (*sl. 6.2*), ki izmed omenjenih edina sodi v 4. tisočletje pr. Kr.

6.2 OPIS NAJDIŠČA IN LEGA NAJDB

Vode Bistre pritekajo na dan v deltastih izvirih pri istoimenskem gradu ob vznožju kraškega masiva Ljubljanskega vrha in se po približno 3 km dolgem vijugavem toku južno od Blatne Brezovice izlivajo v Ljubljanico. Do 4 m globoko in povprečno 10 m široko korito, vrezano v jezerske sedimente in lastne drobnozrnate naplavine, se začne takoj pod sotočjem dveh vzhodnih izvirnih krakov potoka v bližini gradu. Obravnavano najdišče Veliki Otavnik leži okoli 1,1 km po potoku navzdol, nekoliko pod mostom makadamske ceste proti poslopjem Ljubljanskih mlekarn. Pod mostom je Bistra oblikovala 4 m globok podolgovat tolmun, ki se kmalu razcepi v dva, proti severovzhodu potekajoča kraka. Tik pred sotočjem obeh krakov, ki sta vrezana do 1,5 m globoko v polžarico, je

[1] Gaspari, Erič 2007a; 2007b.

temporarily stored at the Institute for the Protection of Cultural Heritage of Slovenia, Regional Unit Ljubljana (ZVKDS OE Ljubljana); dendrochronological samples are stored at the Department of Wood Technology Biotechnical faculty of the University of Ljubljana.

The field team discovered two, so far unknown, pile-dwelling settlements, Mali Otavnik and Veliki Otavnik Ib, and traces of four other potential pile-dwellings Veliki Otavnik Ia, Veliki Otavnik II, Veliki Otavnik III and Bistra I,[1] in bed of the Bistra. However, here we only introduce results of researches on the pile-dwelling settlement Veliki Otavnik Ib (*Fig. 6.2*), as it is the only pile-dwelling among the newly discovered, which dates to the 4th millennium BC.

6.2 DESCRIPTION OF THE SITE AND LOCATION OF FINDS

The Bistra emerges as a delta shaped spring system, close to an eponymous castle, next to the foot of the Karstic massif of the Ljubljanski vrh. It outflows into the Ljubljanica just to the South from Blatna Brezovica, after a c. 3 km long meandering course. Up to 4 m deep and on average 10 m wide riverbed, cut into the fine-grained lake sediments and its own alluvia, starts just under the confluence of the two eastern spring channels, near the castle. The site Veliki Otavnik is located c. 1.1 km downstream, not far from a bridge of a road, which runs towards the buildings of the "Ljubljanske mlekarne". The Bistra formed a 4 m deep oblong pool under the mentioned bridge, which soon splits up into two channels, running in the north-eastern direction. Just before the confluence of both watercourses, which are cut c. 1.5 m deep into the lake marl called polžarica, a smaller complex of prehistoric finds was found on the internal side of a bend, denominated Veliki Otavnik Ia (*Fig. 6.1*). On a shelf, which is an eroded surface of lake marl (286.5 m a.s.l.), is a layer of fine-grained sand. Several pottery sherds with analogies in the Early Bronze Age pile-dwellings Mali Otavnik[2] and Zornica at Blatna Brezovica,[3] animal bones, caprid antlers and stones with round edges were found on its surface, in an area of 1 m^2. Three pieces of wood and a log with a diameter of 30 cm project horizontally from a profile layer. Downstream, in a deep bed with a rectangular cross-section (285.4 m

[1] Gaspari, Erič 2007a; 2007b.
[2] See Gaspari 2008, 57–89.
[3] Dirjec 1991, Pls. 1: 1; 3: 2; 4: 3.

Sl. 6.2: Območje kolišča med posegom leta 2006. Foto: A. Gaspari.
Fig. 6.2: The area of the pile-dwelling during research in 2006. Photo: A. Gaspari.

bil na notranji strani zavoja ugotovljen manjši kompleks prazgodovinskih najdb, poimenovan Veliki Otavnik 1a (*sl. 6.1*). Na terasi, ki predstavlja erodirano površino polžarice (286,5 m n. m. v.), so v plasti drobnozrnatega peska na površini 1 m^2 ležali več kosov keramičnih posod z analogijami na zgodnjebronastodobnih koliščih Mali Otavnik[2] in Zornica pri Blatni Brezovici,[3] živalske kosti in rogovi kaprovidov ter kamni z zaobljenimi robovi. Iz plasti v profilu so vodoravno štrleli trije kosi lesa in deblo s premerom 30 cm. Nizvodno od terase so v globljem koritu pravokotnega preseka (285,4 m n. m. v.), ki je delno zapolnjen s peščenimi sipinami, ležali posamični kosi keramike, najdene so bile tudi živalske kosti, sekira iz rogovja in del kalote človeške lobanje.

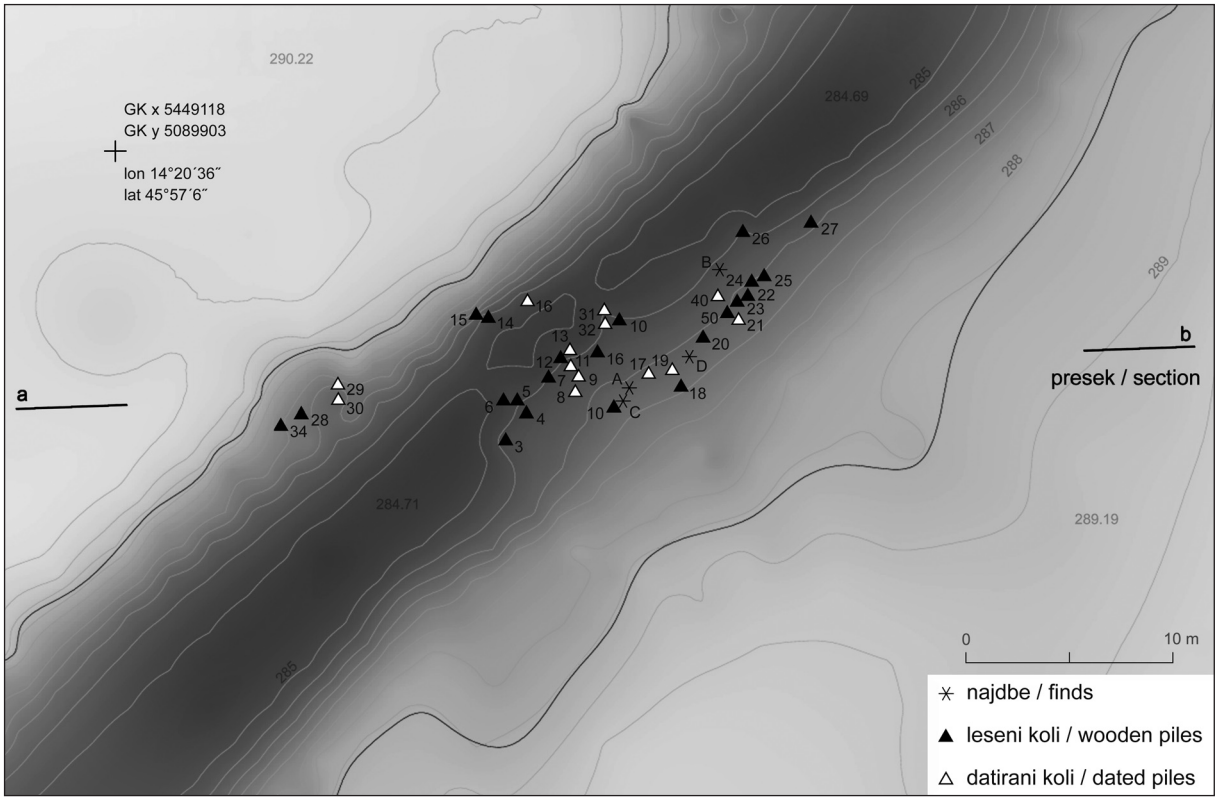
Okoli 50 m pod omenjenim tolmunom se začnejo v strugi pojavljati leseni vertikalni koli (Veliki Otavnik Ib), in sicer v 28 m dolgem in do 8 metrov širokem pasu, ki poteka diagonalno od levega brega proti desnemu v smeri zahod/jugozahod-vzhod/severovzhod (*sl. 6.3*). Med preseki 40 vertikalnih kolov je najpogostejši okrogel, manj je pravokotno obtesanih (*sl. 6.4*). Vsaj dva kola s pravokotnim presekom sta bila pred zabijanjem ožgana. Iz tlorisa (*sl. 6.3*) so prepoznavne tri vzporedne podolgovate skupine oz. linije kolov v smeri jugozahod-severovzhod. V štirih primerih so bili koli zabiti v razmiku 30 cm ali manj.

a.s.l) that is partly filled in with dunes, pottery sherds occur, and animal bones, an antler axe and part of a human cranium were found.

Vertical wooden piles start to occur in the riverbed, c. 50 m downstream from the pool mentioned above (Veliki Otavnik Ib), namely in a 28 m long and up to 8 m wide section, running diagonally from left to right bank in the WSW-ENE direction (*Fig. 6.3*). A circular cross-section is the most frequent among 40 vertical piles. Rectangular piles are rarer (*Fig. 6.4*). At least two piles with rectangular cross-sections were burned before driven into the ground. From the ground plan, we can recognise three parallel oblong groups/lines of piles, running in SW-NE direction (*Fig. 6.3*). In four cases piles were driven into the ground 30 cm or less apart from one another.

Remains of piles are concentrated in a 6 m wide area in the middle of the riverbed. A larger group is preserved in the central part of the riverbed, which is cut up to 2 m deep into lake marl. Altitude variation between the preserved pile tops is up to 1.4 m. The highest piles are located on a shelf just below the left bank, which is an eroded surface of lake marl (*Fig. 6.5*). It is located at 286.7 m a.s.l., which is very similar to the documented height of lake marl at the Veliki Otavnik Ia and the pile-dwelling Mali Otavnik (I), which were 286.9–287.1 m a.s.l.. Identification of an assumed cultural horizon in banks was not possible due to siltation of the right third of the riverbed and root systems, which cover the upper lying parts of the left bank.

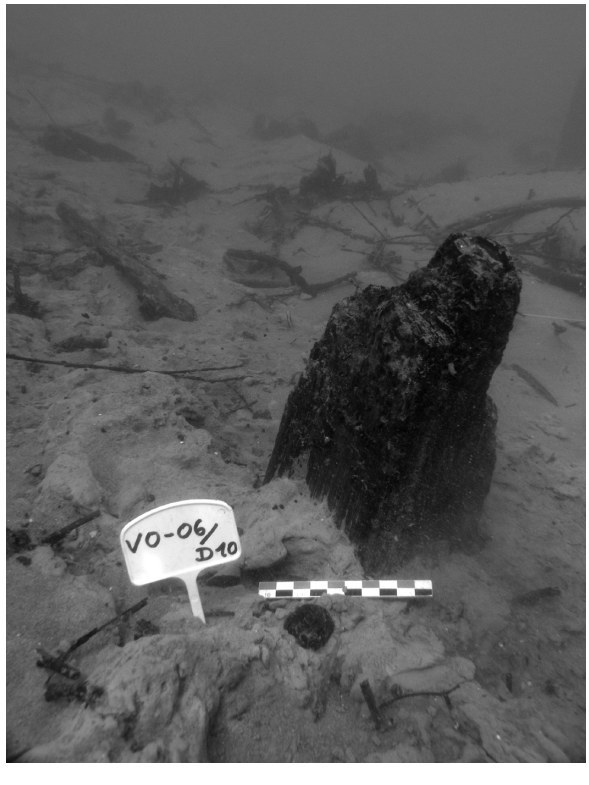
[2] Glej Gaspari 2008, 57–89.
[3] Dirjec 1991, t. 1: 1; 3: 2; 4: 3.



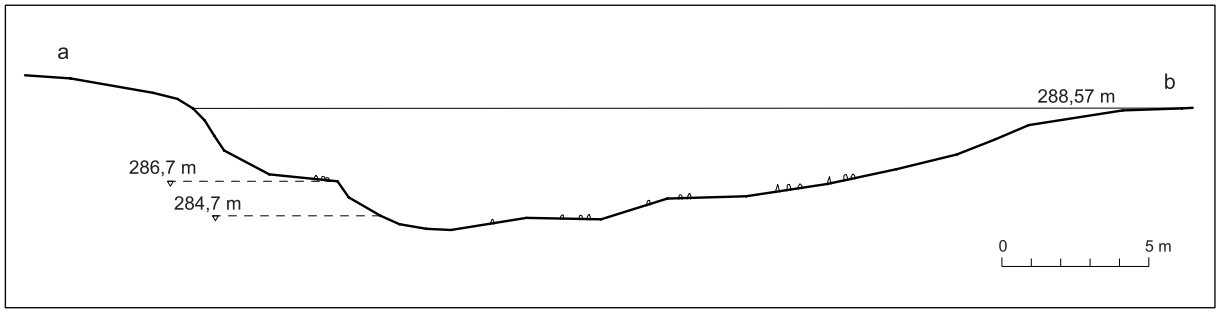
Sl. 6.3: Tlorisni načrt kolov in lokacij dvignjenih predmetov na najdišču Veliki Otavnik Ib. Pripravil: M. Erič.
Fig. 6.3: Ground plan of piles and locations of collected objects at the site Veliki Otavnik Ib. Prepared by: M. Erič.

Ostanki kolov se zgoščajo v 6 m širokem pasu v sredini struge, večja skupina je ohranjena tudi v osrednjem delu korita, ki je na tem mestu do 2 m globoko vrezano v polžarico. Višinska razlika med ohranjenimi vrhovi kolov dosega 1,4 m. Najvišje ležeči koli so ohranjeni na stopnici tik pod levim bregom, ki predstavlja erodirano površino polžarice (*sl. 6.5*). Ta leži na 286,7 m n. m. v., kar je zelo podobno višini polžarice na lokaciji Veliki Otavnik Ia in situaciji na kolišču Mali Otavnik (I), kjer je bila polžarica dokumentirana na 286,9–287,1 m n. m. v. Identifikacijo domnevanega kulturnega horizonta v brežinah sta preprečila močna zamuljenost desne tretjine struge in koreninski spleti, ki prekrivajo nadvodni del leve brežine.

Najdb v okolici kolov na najdišču Veliki Otavnik Ib je malo. Poleg redkih kostnih ostankov živali je bilo opaženih le nekaj odbitkov in ne več kot 5 odlomkov keramike, nekaj metrov po toku navzdol, kjer kolov ni več, pa so predmeti še redkejši. V globljem tolmunu, okoli 20 m nizvodno od kolišča, sta bila najdena še vijček in rogovje navadnega jelena brez sledov obdelave, nato pa najdbe povsem izginejo. Nanje ponovno naletimo tik pred koncem ravnega severnega dela meandra, kjer je bila v sredini korita ugotovljena večja koncentracija keramike in orodij na prevrtanih bazah jelenjih rogovij (Veliki Otavnik II). Vzporedno z mestom najdbe sta oba bregova zamuljena, koli pa niso bili opaženi. Predmeti se posamično pojavljajo še dobrih 30 m po toku navzdol.



Sl. 6.4: Lesen kol. Kolišče Veliki Otavnik Ib. Foto: A. Gaspari.
Fig. 6.4: Wooden pile. Pile-dwelling Veliki Otavnik Ib. Photo: A. Gaspari.



Sl. 6.5: Prečni presek struge na območju najdišča. Risba: M. Erič.
Fig. 6.5: Cross section of the riverbed in the area of the site. Drawn by: M. Erič.

6.3 OPREDELITEV GRADIVA

V okolici kolov s kolišča Veliki Otavnik Ib se poleg natančneje neopredeljivih odlomkov keramičnih posod pojavljajo tudi kamniti predmeti, med njimi odlomek žrmelj iz bele luknjičave kamnine (*t. 6.1:* 5), v celoti ohranjen terilni kamen okroglega preseka z ravno zgornjo in spodnjo površino iz temnega peščenjaka (*t. 6.1:* 4), ostanek enostransko izrobljenega diskastega jedra iz sivozelenega roženca (*t. 6.1:* 3), strgalo (*t. 6.1:* 2) in praskalo na klini iz presojnega rjavega roženca (*t. 6.1:* 1). Med keramičnimi najdbami z Velikega Otavnika Ib izstopa samo kroglasti lonček iz temnosivo žgane gline z močnimi primesmi karbonatnega peska (*t. 6.1:* 6).

6.4 DENDROKRONOLOŠKA ANALIZA

V dendrokronološkem laboratoriju smo pregledali 30 vzorcev in določili lesne vrste: 17 vzorcev hrasta (*Quercus* sp.), 6 jesena (*Fraxinus* sp.) in po 2–3 vzorce topola (*Populus* sp.), vrbe (*Salix* sp.) in črne jelše (*Alnus glutinosa*) (*tab. 6.1*).

Na 13 vzorcih (11 hrastovih in 2 jesenovih), ki so imeli dovolj branik, smo opravili dendrokronološko analizo. Vsa zaporedja širin branik smo medsebojno sinhronizirali, kar pomeni, da je bil preiskani les iz istega obdobja. Na osnovi 10 zaporedij širin branik smo sestavili plavajočo kronologijo in jo primerjali z razpoložljivimi kronologijami kolišarskih naselbin z Ljubljanskega barja. Izkazalo se je, da je preiskani les z Velikega Otavnika Ib del konstrukcije, ki je bila postavljena v času kolišarske naselbine Stare gmajne, natančneje v času, ko so šle gradbene aktivnosti na Starih gmajnah h koncu.[4]

Relativni dendrokronološki datumi najmlajših branik (*tab. 6.1*) so od leta 85 do 178, zato se tudi kronologija Velikega Otavnika Ib: VO6-QUSP1, konča v relativnem letu 178. S *tabele 6.1* je razvidno, da imajo

[4] Glej poglavje 7 v tem zborniku.

Only a small amount of finds occur near the piles at the Veliki Otavnik Ib. Besides rare animal bone remains, we found a small number of flakes and no more than 5 pottery fragments. Finds are even rarer a few metres downstream, where piles are not present anymore. A spindle whorl and an unworked red deer antler were found in a deeper pool, c. 20 m downstream from the pile-dwelling. There were no finds present beyond this point. They occur again just prior to the end of the straight northern part of the meander. There, larger concentration of pottery and tools, made on perforated deer antler beams, were discovered in the middle of the riverbed (Veliki Otavnik II). Both riverbanks, parallel to this area of concentration, are silted. We have not notice any piles. Individual finds still occur in an area of 30 m downstream.

6.3 DEFINITION OF FINDS

Apart from indefinable pottery sherds, found in the vicinity of the pile-dwelling Veliki Otavnik Ib, also stone objects occur, such as a fragment of a quern made of white porous rock (*Pl. 6.1:* 5), an entirely preserved ground stone with circular cross-section and straight upper and lower surface, made of dark sandstone (*Pl. 6.1:* 4), a fragment of unipolar discoid core, made of greyey green chert (*Pl. 6.1:* 3), scraper (*Pl. 6.1:* 2) and an endscraper on a blade made of translucent brown chert (*Pl. 6.1:* 1). Only a small round pot, made of dark grey fired clay with rich additions of carbonate sand (*Pl. 6.1:* 6), stands out among pottery finds from the Veliki Otavnik Ib.

6.4 DENDROCHRONOLOGICAL ANALYSIS

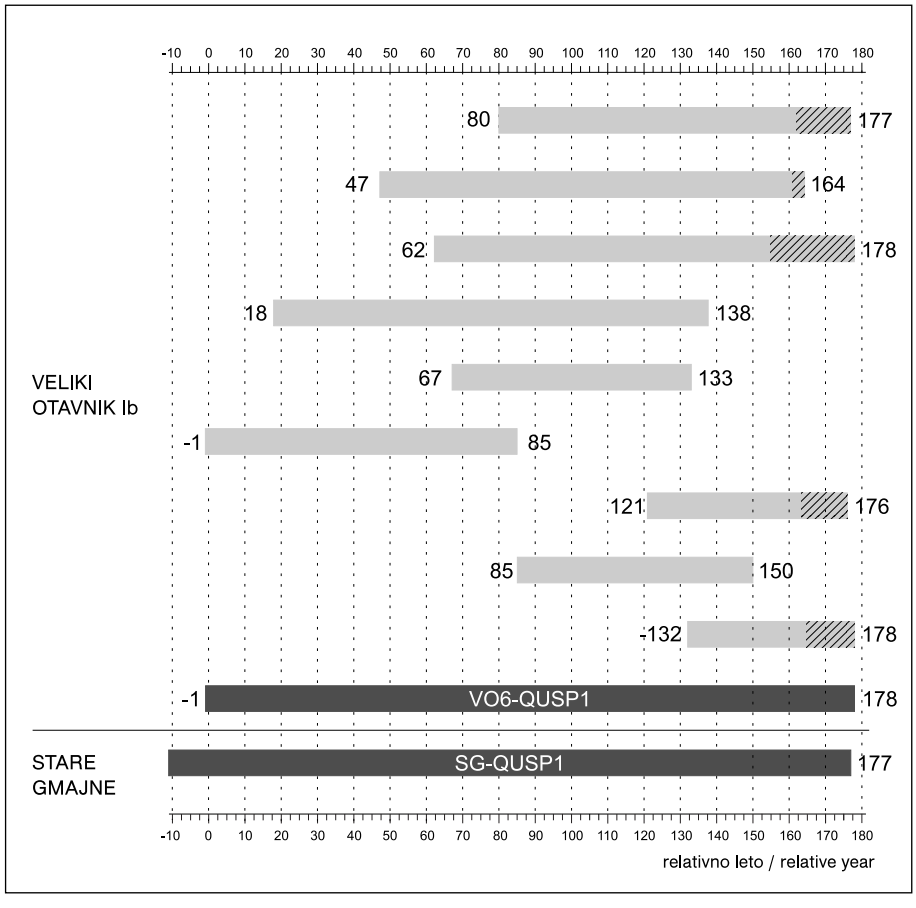
In dendrochronological laboratory, we investigated and determined wood species of 30 samples: 17 were oak (*Quercus* sp.), 6 ash (*Fraxinus* sp.) and 2–3 samples each were poplar (*Populus* sp.), willow (*Salix* sp.) and black alder (*Alnus glutinosa*) (*Tab. 6.1*).

Tab. 6.1: Podatki o vzorcih lesa z Velikega Otavnika Ib (VO-06). Relativno leto 178 po radiokarbonski dataciji predstavlja leto 3108 ± 12 pr. Kr.
Tab. 6.1: Wood samples from Veliki Otavnik Ib (VO-06). Relative year 178 according to radiocarbon dating represents a year 3108 ± 12 BC.

VZOREC SAMPLE	Dendro	Drevesna vrsta Tree species	Premer Diameter	Klan Splitted	Branike Tree rings	Branike beljave Sapwood tree rings	Skorja Bark	Relativni datumi Relative dates
VO-06-D03		*Populus* sp.	11,5	ne / no	22		da / yes	
VO-06-D04		*Quercus* sp.	6,5	ne / no	13		da / yes	
VO-06-D05		*Salix* sp.	9,5	ne / no	20		da / yes	
VO-06-D06		*Quercus* sp.	12,5	ne / no	23		ne / no	
VO-06-D07		*Quercus* sp.	10,0	ne / no	22		da / yes	
VO-06-D08	da / yes	*Quercus* sp.	11,5	da / yes	99	13	ne / no	**177**
VO-06-D09	da / yes	*Quercus* sp.	13,5	da / yes	119	2	ne / no	**164**
VO-06-D11	da / yes	*Quercus* sp.	14,0	da / yes	118	20	ne / no	**178**
VO-06-D12		*Fraxinus* sp.	4,0	ne / no	13		da / yes	
VO-06-D13	da / yes	*Quercus* sp.	10,5	da / yes	121	0	ne / no	**138**
VO-06-D14		*Quercus* sp.	6,3	ne / no	12		da / yes	
VO-06-D15		*Alnus glutinosa*	15,0	ne / no	25		da / yes	
VO-06-D16	da / yes	*Quercus* sp.	9,0	da / yes	68	0	ne / no	**133**
VO-06-D17	da / yes	*Quercus* sp.	13,5	ne / no	145	26	ne / no	
VO-06-D19	da / yes	*Quercus* sp.	9,5	da / yes	88	0	ne / no	**85**
VO-06-D20		*Quercus* sp.	9,0	da / yes	38		ne / no	
VO-06-D21	da / yes	*Quercus* sp.	12,0	da / yes	57	11	ne / no	**176**
VO-06-D22		*Fraxinus* sp.	9,0	ne / no	26		?ne / no	
VO-06-D23		*Quercus* sp.	7,5	da / yes	31		ne / no	
VO-06-D24		*Fraxinus* sp.	6,0	ne / no	24		?da / yes	
VO-06-D25		*Salix* sp.	7,0	ne / no	14		ne / no	
VO-06-D26		*Populus* sp.	4,0	ne / no	9		ne / no	
VO-06-D27		*Populus* sp.	5,5	ne / no	7		ne / no	
VO-06-D28		*Fraxinus* sp.	11,0	ne / no	28		ne / no	
VO-06-D29	da / yes	*Quercus* sp.	12,0	da / yes	71	0	ne / no	
VO-06-D30	da / yes	*Fraxinus* sp.	10,0	ne / no	53		da / yes	
VO-06-D31	da / yes	*Fraxinus* sp.	9,0	ne / no	36		da / yes	
VO-06-D32	da / yes	*Quercus* sp.	6,5	ne / no	67	0	ne / no	**150**
VO-06-D34		*Alnus glutinosa*	12,5	da / yes	40		ne / no	
VO-06-D40	da / yes	*Quercus* sp.	11,5	da / yes	48	16	ne / no	**178**

vzorci različno število branik beljave. Vzorci, datirani v relativna leta 176–178, so imeli ohranjeno večino beljave, pri ostalih vzorcih pa jo je ohranjen le del beljave ali pa manjka zaradi obdelave lesa ali zaradi obrabe oz. poškodovanja. Vzorec VO-06-D11 ima tako 20 branik beljave in relativni datum zadnje branike 178. Ker ne vsebuje skorje in ker je zadnja branika nepopolna, ne moremo zagotovo ugotoviti, ali je zadnja branika na vzorcu tudi zadnja branika, ki je nastala, ko je drevo še rastlo. Vzorec VO-06-D19 nima beljave, relativni datum zadnje branike pa je 85. Glede na njegovo obliko sklepamo, da zunanji del vzorca ni ohranjen. Glede na relativne datume in

13 samples (11 of oak and 2 of ash) contained enough annual rings for dendrochronological analysis. We cross-dated all sequences of annual-ring widths, meaning that all of the wood studied was contemporary. Based on 10 sequences of annual-ring widths, we created a floating annual-ring chronology and compared it to other available chronologies from the pile-dwelling settlements of the Ljubljansko barje. It turned out that the examined wood from Veliki Otavnik Ib was part of a construction, built contemporary to the pile-dwelling



Sl. 6.6: Časovni razponi zaporedij širin branik in relativni datumi najmlajše branike vzorcev iz Velikega Otavnik (VO-06-D08–VO-06-D40), združenih v kronologijo (VO6-QUSP1) in relativno datiranih s kronologijo Starih gmajn (SG-QUSP1, verzija 2007). Šrafura predstavlja število branik v beljavi. Relativno leto 178 po radiokarbonski dataciji predstavlja leto 3108 ± 12 pr. Kr.
Fig. 6.6: Time spans of annual-ring sequences and relative dates of the youngest annual rings from Veliki Otavnik (VO-06-D08–VO-06-D40) integrated to chronology (VO6-QUSP1) and relatively dated with the chronology of Stare gmajne (SG-QUSP1, version 2007). The hatch represents the quantity of sapwood annual rings. Relative year 178 corresponds with 3108 ± 12 BC.

ohranjenost lesa sklepamo, da je bil ves datirani les za konstrukcijo z Velikega Otavnika Ib posekan sočasno, razlike v datiranju pa so posledica manjkajočih branik na periferiji vzorcev.

Plavajočo kronologijo VO6-QUSP1 smo primerjali z vsemi razpoložljivimi kronologijami dendrokronološkega laboratorija na Oddelku za lesarstvo. Ujemala se je s hrastovo kronologijo iz Starih gmajn: SG-QUSP1, verzija 2007. Statistični kazalniki ujemanja (GLK = 71 %, t_{BP} = 8,6) nedvoumno potrjujejo sočasnost kronologij.

Slika 6.6 kaže, da je zadnja branika kronologije VO6-QUSP1 nastala 1 leto kasneje kot zadnja branika kronologije s Starih gmajn: SG-QUSP1. Les z relativnim datumom 177 (natančneje 172–177 oz. med letoma 3114 in 3109 ± 12 pr. Kr.) smo našli v jarkih številka 1, 3 in 5 na vzhodnem in v jarku 13 na zahodnem delu naselbine.[5] Glede na radiokarbonsko datacijo zadnje branike v kronologiji Starih gmajn SG-QUSP1 so se gradbene

[5] Glej poglavje 7 v tem zborniku: *sl. 7.8*.

settlement Stare gmajne, during the last stages of building activity at Stare gmajne to be precise.[4]

Relative dendrochronological dates of the youngest annual rings (*Tab. 6.1*) are 85 to 178. That is why the chronology of Veliki Otavnik Ib: VO6-QUSP1, ends in the relative year 178. *Table 6.1* shows that samples have different quantity of sapwood annual rings. Samples, dated to relative years 176–178, have the majority of sapwood preserved, while the other samples only contain some sapwood or sapwood is entirely missing due to woodworking/wear and tear. Sample VO-06-D11 contains 20 sapwood annual rings with the relative date of the outmost annual ring being 178. As it does not contain bark and because its last annual ring is partial, we cannot define whether the last annual ring is also the last annual ring of the tree. Sample VO-06-D19 does not contain sapwood (relative year of the last annual ring is 85). Based on its form, we assume that the outmost part of the sample is not preserved. Considering relative dates

[4] See Chapter 7 in this monograph.

aktivnosti v okviru hrastove kronologije na Velikem Otavniku Ib končale v letu 3108 ± 12 pr. Kr.[6]

6.5 SKLEP

Na podlagi dendrokronološke analize sklepamo, da je koliščarska naselbina Veliki Otavnik Ib sočasna z zamrtjem koliščarske naselbine Stare gmajne, ki leži približno 1 km proti severozahodu. Kot tako jo uvrščamo v skupino kolišč 4. tisočletja pr. Kr., med katerimi poznamo z jugozahodnega dela Ljubljanskega barja še Hočevarico,[7] Črešnjo pri Bistri[8] in Blatno Brezovico.[9]

6.6 KATALOG NAJDB / CATALOGUE OF FINDS

Tabla 6.1

1. Praskalo na fragmentirani klini iz svetlorjavega, rahlo presojnega roženca. Talon je ravno fasetiran. Na distalnem delu dorzalne strani je izdelano čelo praskala.

2. Strgalo na odbitku iz temnorjavega roženca. Talon je pokrit s korteksom. Na desnem lateralnem robu dorzalne strani so retuše. Na distalnem delu dorzalne strani so stopnjevite školjkovite retuše. Na distalnem delu levega lateralnega roba na ventralni strani so retuše.

3. Enostransko izrobljeno diskasto jedro iz temnozelenega roženca.

4. Okrogel tolkač oz. terilnik iz temno zelenkastosivega skrilastega peščenjaka.

5. Kos žrmelj s stanjšanim robom in usločeno delovno površino iz bele, luknjičave kamnine.

6. Odlomek ostenja iz gline s primesmi belega peska do 5 mm velikosti; notranja površina temnosivo žgana, zunanja površina siva do temnosivo žgana.

[6] Glej poglavje 7.1.2.1 v tem zborniku.
[7] Velušček 2004a.
[8] Velušček et al. 2004.
[9] Glej Korošec 1963 ter poglavji 5 in 7 v tem zborniku.

and preservation of wood, we presume that all the wood that we dated and was used for the construction from Veliki Otavnik Ib, was felled simultaneously. Differences in dates are a consequence of missing annual rings on the outmost parts of the samples.

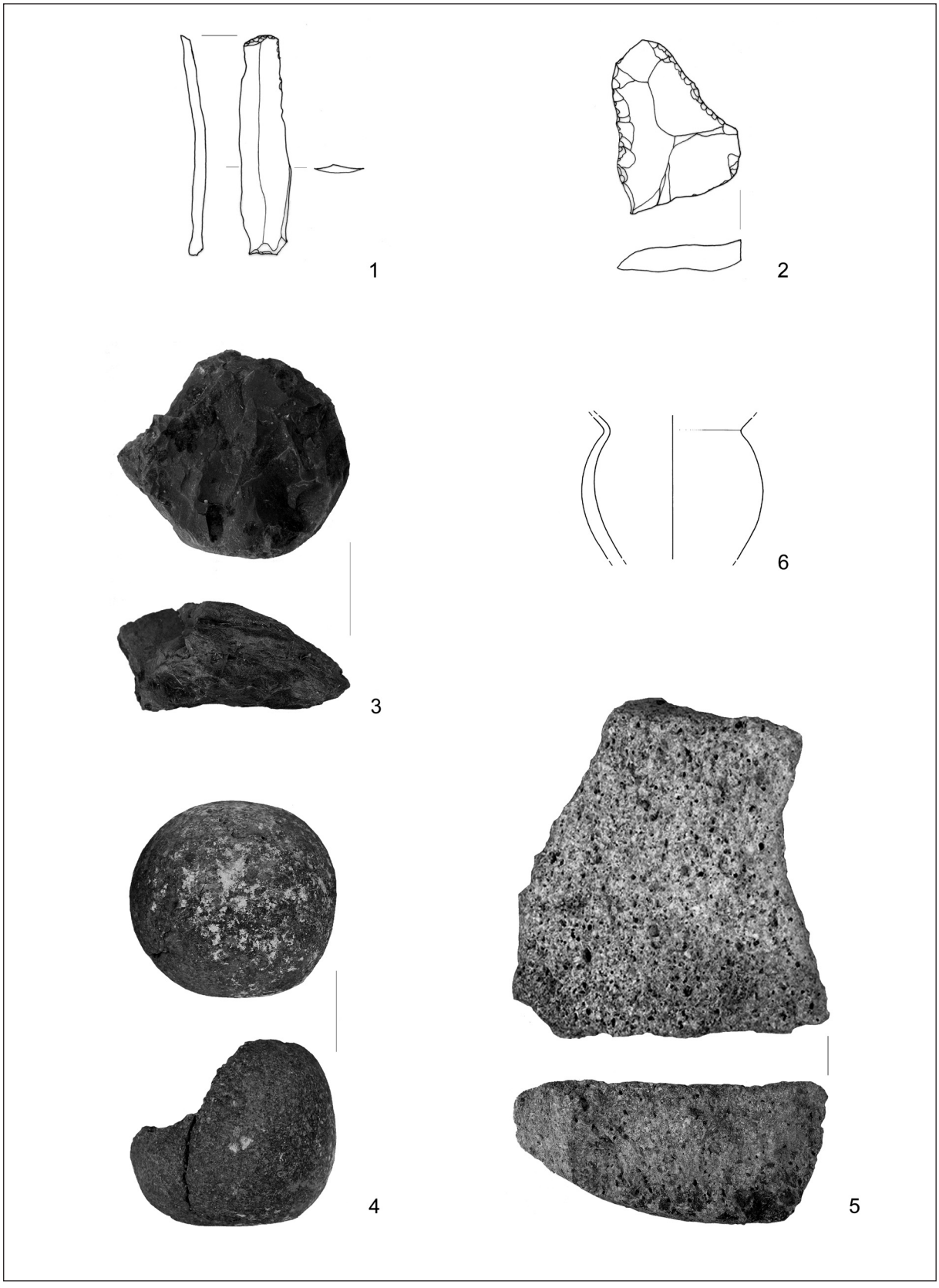
We compared the floating chronology VO6-QUSP1 with all available chronologies of the Dendrochronological laboratory of the Department of Wood Technology. It corresponds with the oak chronology from Stare gmajne: SG-QUSP1, version 2007. The statistical cross-dating parameters (GLK = 71 %, t_{BP} = 8.6) undoubtedly confirm synchronicity of chronologies.

Figure 6.6 shows that the last annual ring of VO6-QUSP1 chronology occurred 1 year after the youngest annual ring of chronology from the Stare gmajne: SG-QUSP1. Wood with relative date 177 (172–177 to be precise, or between 3114 and 3109 ± 12 BC) was found in ditches 1, 3 and 5 in the eastern and in ditch 13 in the western part of the settlement.[5] Considering the radiocarbon date of the youngest annual ring in chronology of the Stare gmajne SG-QUSP1, building activities at Veliki Otavnik Ib terminated in 3108 ± 12 BC, according to oak chronology.[6]

6.5 CONCLUSION

Based on dendrochronological analysis, we presume that the pile-dwelling settlement Veliki Otavnik Ib was contemporary with the last stages of the pile-dwelling settlement Stare Gmajne, which lies c. 1 km to the north-west. It can therefore be categorised into a group of pile-dwellings of the 4th millennium BC. This group also contains Hočevarica,[7] Črešnja pri Bistri[8] and Blatna Brezovica,[9] all from the south-western part of the Ljubljansko barje.

[5] See Chapter 7 in this monograph: *Fig. 7.8.*
[6] See Chapter 7.1.2.1 in this monograph.
[7] Velušček 2004a.
[8] Velušček et al. 2004.
[9] See Chapters 5 and 7 in this monograph and Korošec 1963.



T. 1: Najdbe z območja kolišča Veliki Otavnik Ib iz potoka Bistra. 1–5, kamen. 6, keramika. Risbe: 1–2 B. Kavur; 6 J. Tratnik; foto: 3–5 A. Gaspari. Kamen: m = 1 : 2; keramika: m = 1 : 3.

Pl. 1: Finds from the area of the pile-dwelling Veliki Otavnik Ib, discovered in the Bistra stream. 1–5, stone. 6, pottery. Drawn by: 1–2 B. Kavur; 6 J. Tratnik; photo: 3–5 A. Gaspari. Stone: scale = 1 : 2; pottery: scale = 1 : 3.